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(71)(72) Applicant and Inventor: FISKE, Orlo, J. [US/US]; 122 Benicia Way, Oxnard, CA 93033 (US).

(74) Agents: SLAVIN, Craig, A. et al.; Oppenheimer Wolff & Donnelly, LLP, Suite 3800, 2029 Century Park East, Los Angeles, CA 90067 (US).

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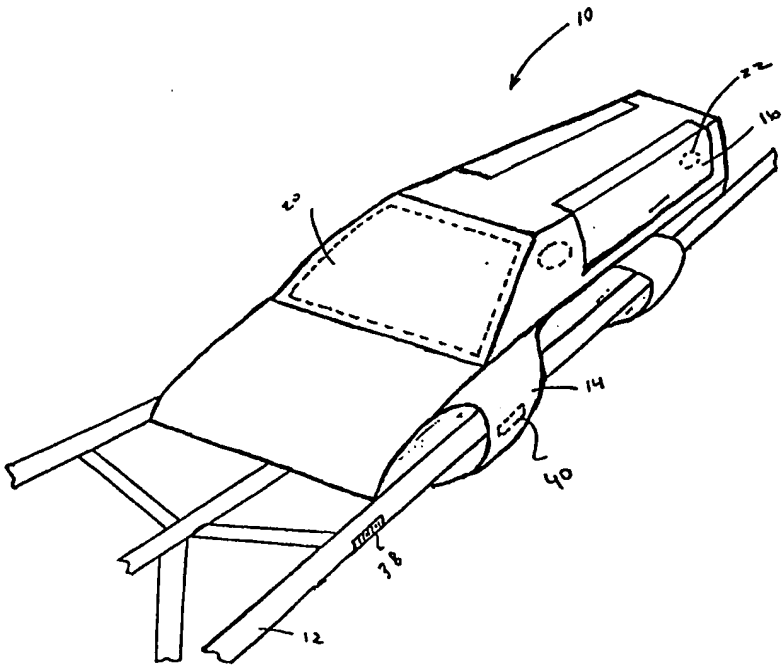

(57) Abstract

An amusement apparatus including a vehicle (10) adapted to travel along a course and carry a passenger, and a presentation apparatus associated with the vehicle (10) to provide the passenger with at least one of audible sensations (22) and visual sensations (20).

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AMUSEMENT VEHICLE

BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention relates generally to amusement rides and, more particularly, to amusement rides which include passenger carrying vehicles.

2. Description of the Related Art

A high profile ride can be critical to the economic viability of an entire amusement park. Some of the most high profile rides are vehicle-based rides. A wide variety of vehicle-based amusement rides have been introduced over the years. Vehicle-based rides, such as roller coasters, log rides, mono-rails, and boat rides, typically consist of a course (such as a track or waterway) and a vehicle. Many of the vehicles associated with these rides are primarily driven by gravity. For example, roller coasters include one or more uphill segments where the car is driven up the track by a track-based drive system. Thereafter, the car relies on gravity and its own momentum as it freely rolls along the track. Such rides are mechanically simple, reliable, and treat riders to the sensations associated with high speeds, loops, rolls, and sustained G-forces. Because many of these rides include multiple vehicles travelling along the course in connected trains or at closely spaced intervals, it is feasible to limit each vehicle to one or two passengers, while keeping the number of riders over a given time period relatively high.

The sensations available to the riders of vehicle-based rides are, however, limited those associated with the movement of the vehicle and the scenery visible to the riders. In an effort to provide ever more exciting rides, amusement parks have concentrated on building bigger and

faster vehicle-based rides. Construction costs for a top-line roller coaster, for example, can exceed 8 million dollars. Visual effects for a top line ride, such as the "Jurassic Park" ride at Universal Studios in California, can exceed 100 million dollars. Thus, despite the fact that vehicle-based rides can accommodate a large number of riders, the profitability of these rides is sometimes less than optimal.

In recent years, vehicle-based rides have encountered competition from a new type of ride which is essentially a modified flight simulator. Riders are seated within a box-like capsule that is mounted on a hydraulically-actuated motion base. The interior of the capsule includes an audio/visual system and the riders face the system's visual display. The motion signals for the base and audio/visual signals are recorded in synchronized fashion. When they are played back, movement of the capsule corresponds to the sights and sounds provided by the audio/visual system. Simulators are capable of providing audio/visual experiences that cannot be provided by roller coasters and other vehicle-based rides. In fact, simulators can provide virtually any combination of images and sounds imaginable.

Unfortunately, the variety of motion sensations that can be provided by a conventional simulator is severely restricted due to the short range of movement possible with a mechanical motion base. So are the G-forces. This restricts the simulator's ability to provide a convincing experience. Another disadvantage associated with simulators used for amusement purposes is the fact that they typically carry up to 30 riders in order to produce enough revenue to offset their high cost. As a result, it is difficult to convince riders that they are in a small space, such as that found in a sports car, the cockpit of a jet fighter, or a bobsled.

OBJECT AND SUMMARY OF THE INVENTION

A general object of the present invention is to provide an amusement ride that is superior to those presently known in the art. In particular, one object of the present invention is to provide an amusement ride that creates the sensations associated with both vehicle-based rides and simulator systems.

In accordance with one aspect of the present invention, some of these and other objectives are accomplished by providing a vehicle (such as a roller coaster car) adapted to travel along a course and carry a passenger, and a presentation apparatus associated with the vehicle and adapted to provide the passenger with at least one of audible sensations and visual sensations. This combination provides passengers with "the best of both worlds," i.e. the sensations associated with high speeds, low speed, loops, rolls, floating and sustained G-forces, as well as the audio/visual stimulation provided by conventional simulators. As a result, the present invention can more realistically simulate the sights, sounds and feelings associated with, for example, jet fighters and river rafts.

Another advantage of the present invention is that no fundamental modifications of established roller coaster design and construction practices is required. A roller coaster can be retrofit by replacing the existing cars with cars that are equipped with an audio/video system in accordance with the present invention. Thereafter, riders will be able to enjoy various sights and sounds designed to correspond to the movement of that particular roller coaster.

The present invention also allows ride intensity to be varied even when the speed of the vehicle and design of the course, such as a roller coaster track, are fixed. This is accomplished by changing the apparent speed, i.e. the speed that the rider thinks the vehicle is travelling, without changing the actual speed. The ride may be altered to suit

either timid or adventurous riders by simply varying the extremity of the audio/video presentation. Low altitude images with gentle maneuvers can be presented to cautious riders, while terrifying heights and ferocious maneuvers may be presented to fearless riders. A single vehicle-based ride in accordance with the present invention may also be used in conjunction with a variety of audio/visual programs (or movies), thereby enhancing the prospects for repeat business. Similarly, if identical rides are built around the country (or world), the per ride cost of new programs would be reduced.

Another advantage lies in the fact that the use of electronically-supplied audio/visual stimulation would permit the construction of vehicle-based rides with unprecedented economy and ride flexibility. Conventional rides maximize sensory impact by climbing high, dropping fast, traveling at high speeds, and passing close to surrounding objects. This requires massive, expensive structures that sometimes include over 7000 feet of track. A vehicle-based ride in accordance with the present invention can be smaller and slower, while appearing to the rider to be bigger and faster because of the additional audio/visual stimulation. Savings in construction costs and real estate will more than offset the extra cost of video displays and playback equipment. The present invention is also easier to locate within an enclosure so as to provide immunity to bad weather.

Many other features and attendant advantages of the present invention will become apparent as the invention becomes better understood by reference to the following detailed description considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Detailed description of the preferred embodiments of the invention will be made with reference to the accompanying drawings.

FIGURE 1 is a perspective view of a roller coaster car and track in accordance with a preferred embodiment of the present invention.

FIGURE 2 is a side view of the roller coaster car shown in FIGURE 1.

FIGURE 3 is a top view of an exemplary vehicle interior in accordance with a preferred embodiment of the present invention.

FIGURE 4 is a top view of an exemplary vehicle interior in accordance with another preferred embodiment of the present invention.

FIGURE 5 is a block diagram of a control system in accordance with a preferred embodiment of the present invention.

FIGURE 6 is a perspective view of a log ride in accordance with another preferred embodiment of the present invention.

FIGURE 7 is a flow chart in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following is a detailed description of the best presently known mode of carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention. The scope of the invention is defined solely by the appended claims.

As illustrated in FIGURES 1 and 2, an exemplary vehicle-based amusement ride in accordance with a preferred embodiment of the present invention is in the form of a roller coaster car 10 which rides on a track 12 having a variety of uphill, downhill and curved portions. One or more of the portions of the track include a track-based drive system to drive the car, such as a chain drive, linear accelerator, or conveyor belt (log rides), thereby providing the car with the momentum necessary to carry it through the course. The drive system may be a mechanical

system or an electro-mechanical system such as a linear motion accelerator. The car 10 may be attached to a series of cars in train-like fashion. The car 10 includes wheel wells 14 that house upper and lower wheels which roll along the track and secure the car to the track in the conventional manner. Passengers enter the interior of the car through doors 16. The interior of the car includes one or more passenger seats 18. The seats may be arranged side-by-side or front-to-back. The interior of the exemplary car also includes a visual display 20, in the location typically associated with a forward window, and a plurality of speakers 22. The display may be oriented in the manner shown, or in a generally vertical fashion. The visual display 20 and speakers 22 may be used to provide images and sounds such as those that a rider would expect to see if riding in a jet fighter, bobsled, attack helicopter, etc. Additional screens may be provided within the vehicles at the locations typically associated with side windows and rear-view mirrors to further enhance the passenger's experience.

The audio and image data provided to the display is stored in, and played by, an audio/visual storage and playback system 24 that is operably connected to the display 20 and speakers 22 (FIGURE 3). Display 20 may be a thin flat-panel display in a framework made to look like a windshield. Suitable displays include plasma video display units and liquid crystal displays. Alternatively, as shown in FIGURE 4, vehicle 10' includes a reflective screen 26 and a video projector 28. A front projection system is typically preferable to a rear projection system because it results in a thin screen, smaller car dimensions, and the appearance of a front windshield. Three-dimensional video can be produced by an electronic video source that alternates left eye and right eye views on the video display, synchronized with electronic shutter goggles worn by the rider, or by twin projectors producing oppositely polarized left eye and right eye views seen through

polarized goggles worn by the rider. It is noted here that the audio/visual storage and playback system may also be housed at a location remote from the vehicle and the appropriate data transmitted thereto and therefrom by a radio system, preferably of the digital variety.

Turning to FIGURE 5, the exemplary audio/visual storage and playback system 24 includes a microprocessor-based controller 24a, a power supply 24b for the vehicle's electronic components, and an audio/video storage/playback unit 24c. The power supply 24b contains power conditioning equipment, batteries (or other suitable storage devices) and a recharging pickup that provides a connection to recharge the power storage devices from an external power source when necessary. The storage/playback unit 24c may, for example, be of the type which stores and retrieves audio and image data in digital form (such as on a hard disk drive) or of the type which stores and retrieves data in analog form (such as on a tape). The unit must also be able to play at variable rates. The storage/playback system 24 also includes a location sensor input 24d (discussed below), an audio output 24e that is connected to an amplifier (not shown) associated with speakers 22 and a visual output 24f that may be connected to the display 20 or projector 28.

As shown by way of example in FIGURE 6, another exemplary vehicle-based amusement ride is a log ride having a buoyant car 30 that travels along a waterway 32. The rider 34 is provided with sensory headgear 36 connected to the audio and visual outputs 24e and 24f. The headgear 36 may include dual video displays (one for each eye) to provide stereo imagery, a speaker for each ear, and a head motion tracker to allow sounds and images to be keyed to head motion. Such head gear is commonly employed in virtual reality systems. Displayed images correspond to the rider's line of sight, as though the rider were actually in a movie. In a digital system, this may be accomplished through the use of conventional virtual

reality technology. To accomplish this in an analog system, audio and video images are stored on wide-field video. A head tracker determines which area of the image is sent to the head-mounted displays based on the line of sight. The sensory headgear 36 may also be used in the closed roller coaster car shown in FIGURES 1 and 2, a conventional open roller coaster car, or any other amusement vehicle.

In accordance with the preferred embodiment, the audio and image data is timed in such a manner that the imagery and sounds correspond to the movement of the vehicle. Thus, the vehicle-based sensations associated with slow speeds, high speeds, acceleration, deceleration, changes in direction, shaking, sudden stops, etc. will augment the experience provided by the imagery and sound. If, for example, the vehicle is a roller coaster car that is in a long fast decent, then the images and sounds may correspond to that which would be seen and heard by a pilot as a jet fighter descends. As the roller coaster car banks upwardly, the images and sounds would change accordingly.

The inventor herein has determined that the speed of amusement vehicles at a given point on the course (or track) will vary slightly over time. Such variations are caused by, for example, differences in passenger weight and environmental variables such as wind speed, air temperature and air pressure. In order to insure that the images and sounds properly correspond to the location of the vehicle along the course, the present audio/visual storage and playback system 24 includes a compensation system. Generally speaking, the compensation system monitors the location of the vehicle and compares the location to location data that is stored with the audio data and image data and output therewith. The audio and video playback speed is then adjusted, if necessary, to compensate for any differences.

Referring more specifically to FIGURES 1, 2 and 6, an exemplary method of monitoring the location of a vehicle is

to provide a series of location identifying symbols 38 along the course and a symbol reader 40 on the vehicle. The symbols may, for example, be in the form of bar code symbols which provide specific information, such as the symbol's distance from the ride's starting point. Alternatively, the symbols would provide no information in and of themselves and be positioned at predetermined intervals (such as every 10 feet). The compensation system would simply count the symbols as they are sensed to determine vehicle location. Other systems, such as radio-based systems, may also be employed to locate the vehicle. The information concerning the vehicle's actual location is provided to the audio/visual storage and playback system microprocessor 24a through input 24d.

An exemplary program used by microprocessor 24a to compensate for variations in vehicle speed is shown in FIGURE 7. Once the ride begins (step 100), the audio/visual storage and playback system microprocessor 24a will begin retrieving expected location data (step 102) from the storage/playback unit 24c as it transmits audio and image data to the outputs 24e and 24f. The expected location data is compared to the actual location data received via input 24d to determine whether the proper images and sounds are being provided to the passenger (step 103). The fact that the actual location data identifies where the vehicle just was and the expected location data identifies the location where the vehicle should be in the next instant is, of course, accounted for. If the vehicle is proceeding as expected, then the audio and visual presentation will continue until the ride ends (steps 104-107). The presentation will also continue if the vehicle is ahead of or behind schedule (steps 108 and 109). However, the playback speed of the storage/playback unit 24c will be slightly adjusted by the microprocessor 24a for a predetermined period (steps 110-112). The magnitude of the period is dependant on the magnitude of difference between the expected location and the actual location.

Although the present invention has been described in terms of the preferred embodiment above, numerous modifications and/or additions to the above-described preferred embodiments would be readily apparent to one skilled in the art.

Interactive electronic games, as opposed to passively viewed images and sounds, may be provided through the storage and playback system 24. The vehicles here would include passenger operated controls connected to the system. Passengers would, therefore, be more active participants, such as "gunners" in a vehicle that appears to be piloted by another person, remote control, or intelligent computer.

With respect to the movement of the vehicle, motion may be controlled by devices such as brakes, spinning drive wheels and linear induction motors external to the cars to selectively vary vehicle speed and further increase motion flexibility. The vehicles may also, of course, be slowed or stopped for periods corresponding to segments of the audio/visual production that require little or no vehicle movement. The vehicle track 12 may also be in the form of a reconfigurable track having track switches, analogous to those used in a railroad switchyard, that allow the order of track segments covered by the vehicle to be varied according to the particular audio/video production shown. This would increase the element of surprise by preventing riders from becoming too accustomed to one fixed motion and audio/video sequence.

It is intended that the scope of the present invention extends to all such modifications and/or additions and that the scope of the present invention is limited solely by the claims set forth below.

What is claimed is:

1. An apparatus for providing a plurality of sensations, comprising:

a course defining a plurality of predetermined course sensation points;

a vehicle adapted to travel along the course and carry at least one passenger;

a vehicle location determining device, associated with at least one of the course and the vehicle, adapted to produce course sensation point signals identifying the location of the vehicle on the course;

a sensation system including

a storage apparatus adapted to store at least one of audio data for producing a series of audible sensations which respectively correspond to predetermined course sensation points and image data for producing a series of visual sensations which respectively correspond to predetermined course sensation points,

a presentation apparatus associated with the vehicle and adapted to provide the at least one passenger with at least one of audible sensations corresponding to the audio data and visual sensations corresponding to the visual data, and

a playback apparatus, operably connected to the storage apparatus and the presentation apparatus, adapted to provide the presentation apparatus with at least one of audio data and image data from the storage apparatus; and

a control system adapted to receive a course sensation point signal from the vehicle location determining device, determine whether the at least one of audio data and image data provided to the presentation apparatus is the data corresponding to the course sensation point identified by the received course sensation point signal, and adjust the playback apparatus in response to a determination that the at least one of audio data and image

data does not correspond to the course sensation point.

2. An apparatus as claimed in claim 1, wherein the course comprises at least one rail.

3. An apparatus as claimed in claim 1, wherein the course comprises a closed loop roller coaster track and the vehicle comprises at least one roller coaster car.

4. An apparatus as claimed in claim 1, wherein the course comprises a waterway and the vehicle comprises a buoyant vehicle.

5. An apparatus as claimed in claim 1, wherein storage apparatus stores the at least one of audio data and image data in digital form.

6. An apparatus as claimed in claim 1, wherein the at least one of audio data and image data comprises both audio data and image data.

7. An apparatus as claimed in claim 1, wherein the presentation apparatus comprises head gear including a visual display and speakers.

8. An apparatus as claimed in claim 1, wherein the presentation apparatus comprises a visual display and speakers.

9. An apparatus as claimed in claim 1, wherein the course includes an upwardly extending portion, the apparatus further comprising:

a driving mechanism associated with the upwardly extending portion of the course and adapted to drive the vehicle upwardly along the upwardly extending portion.

10. An apparatus as claimed in claim 1, wherein the

presentation apparatus provides three-dimensional visual sensations.

11. An apparatus as claimed in claim 1, wherein the at least one of audio data and image data comprises interactive game data and the vehicle includes passenger operated game controls operably connected to the sensation system.

12. An apparatus as claimed in claim 1, wherein the course includes at least one switch adapted to selectively divert the vehicle to one of at least two course segments.

13. An apparatus as claimed in claim 1, further comprising:

a motion control device adapted to selectively vary the speed of the vehicle.

14. An apparatus for providing a plurality of sensations, comprising:

a course defining at least an upper portion, a lower portion, and an intermediate portion extending generally from the upper portion to the lower portion;

a vehicle adapted to travel along the course and carry at least one passenger;

a driving mechanism associated with the course and adapted to operably engage the vehicle and drive the vehicle along a portion of the course; and

a presentation apparatus associated with the vehicle and adapted to provide the at least one passenger with at least one of audible sensations and visual sensations.

15. An apparatus as claimed in claim 14, further comprising:

a storage apparatus, operably connected to the presentation apparatus, adapted to store at least one of

audio data for producing a series of audible sensations and image data for producing a series of visual sensations.

16. An apparatus as claimed in claim 15, wherein storage apparatus stores the at least one of audio data and image data in digital form.

17. An apparatus as claimed in claim 15, wherein the course defines a plurality of predetermined course sensation points, the series of audible sensations respectively correspond to predetermined course sensation points, and the series of visual sensations respectively correspond to predetermined course sensation points.

18. An apparatus as claimed in claim 17, further comprising:

a vehicle location determining device, associated with at least one of the course and the vehicle, adapted to produce course sensation point signals identifying the location of the vehicle on the course;

a playback apparatus, operably connected to the storage apparatus and the presentation apparatus, adapted to provide the presentation apparatus with at least one of audio data and image data from the storage apparatus; and

a control system adapted to receive a course sensation point signal from the vehicle location determining device, determine whether the at least one of audio data and image data provided to the presentation apparatus is the data corresponding to the course sensation point identified by the received course sensation point signal, and adjust the playback apparatus in response to a determination that the at least one of audio data and image data does not correspond to the course sensation point.

19. An apparatus as claimed in claim 14, wherein the course comprises at least one rail.

20. An apparatus as claimed in claim 14, wherein the course comprises a closed loop roller coaster track and the vehicle comprises at least one roller coaster car.

21. An apparatus as claimed in claim 14, wherein the course comprises a waterway and the vehicle comprises a buoyant vehicle.

22. An apparatus as claimed in claim 14, wherein the at least one of audio data and image data comprises both audio data and image data.

23. An apparatus as claimed in claim 14, wherein the presentation apparatus comprises head gear including a visual display and speakers.

24. An apparatus as claimed in claim 14, wherein the presentation apparatus comprises a visual display and speakers.

25. An apparatus as claimed in claim 14, wherein the presentation apparatus provides three-dimensional visual sensations.

26. An apparatus as claimed in claim 14, wherein the at least one of audio data and image data comprises interactive game data and the vehicle includes passenger operated game controls operably connected to the sensation system.

27. An apparatus as claimed in claim 14, wherein the course includes at least one switch adapted to selectively divert the vehicle to one of at least two course segments.

28. An apparatus as claimed in claim 14, further comprising:

a motion control device adapted to selectively vary the speed of the vehicle.

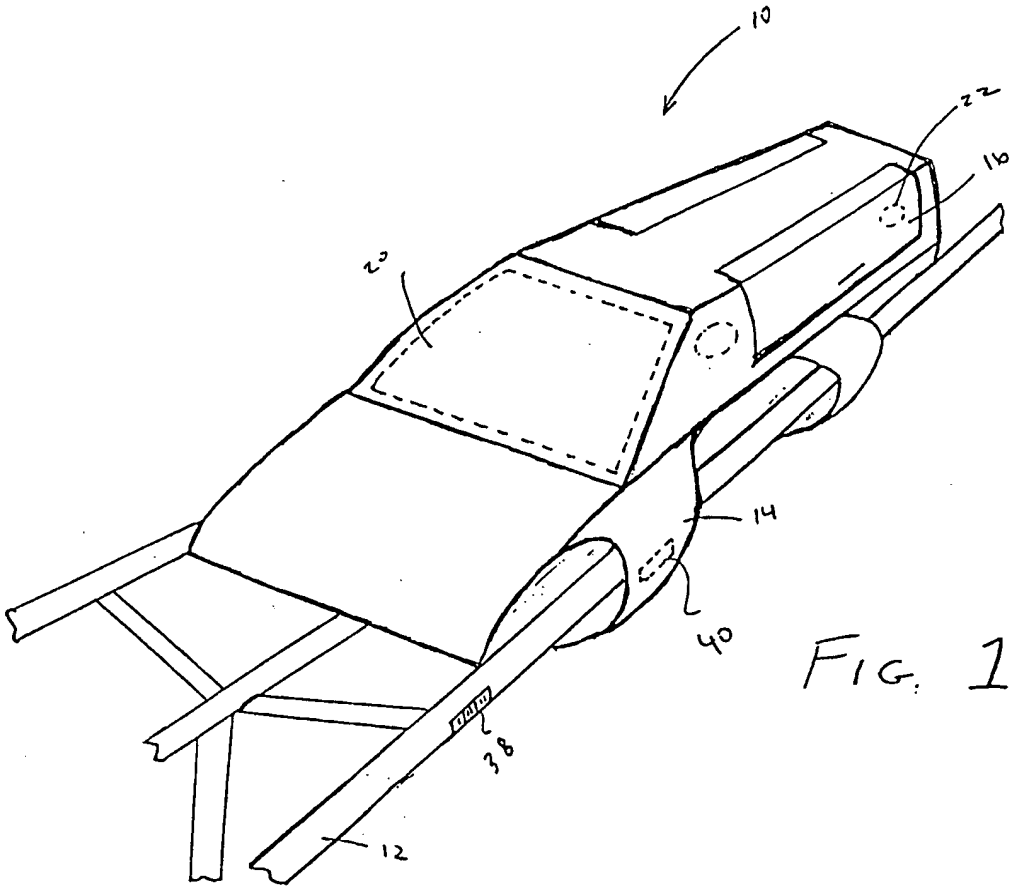

FIG. 1

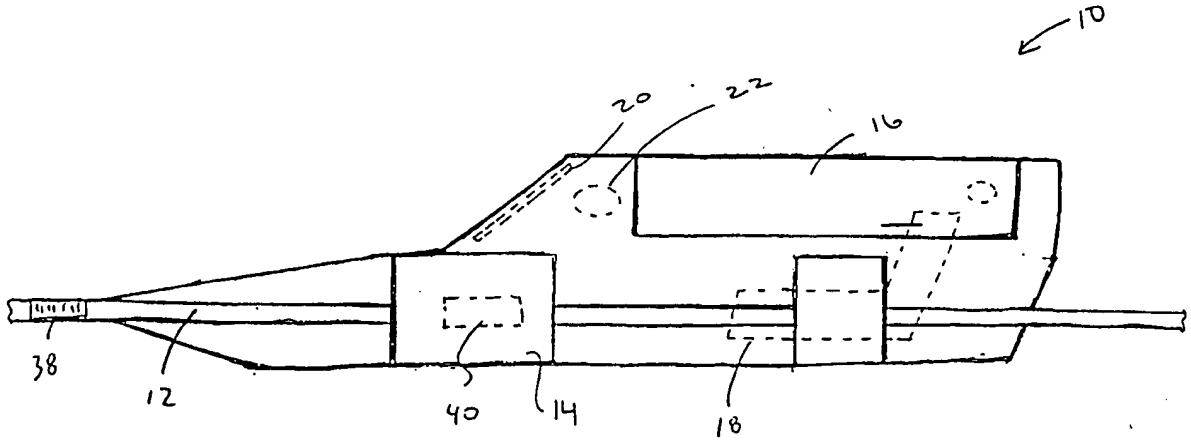

FIG. 2

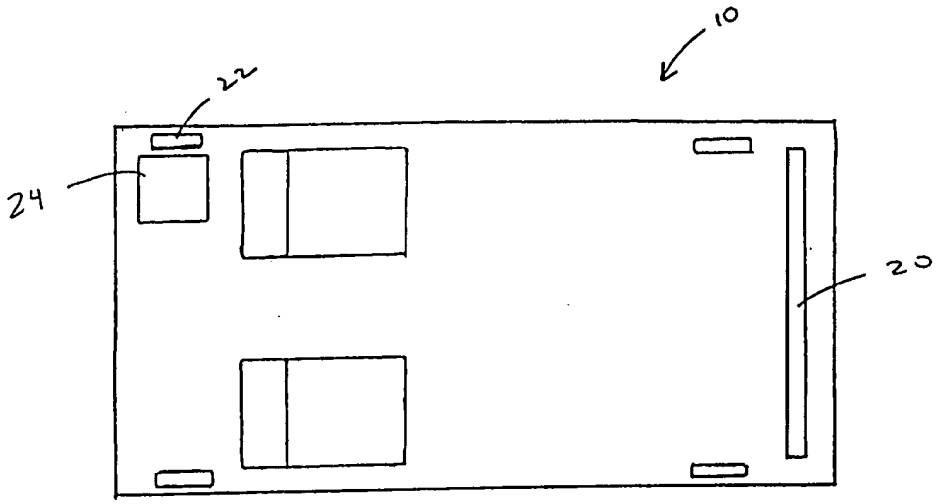

FIG. 3

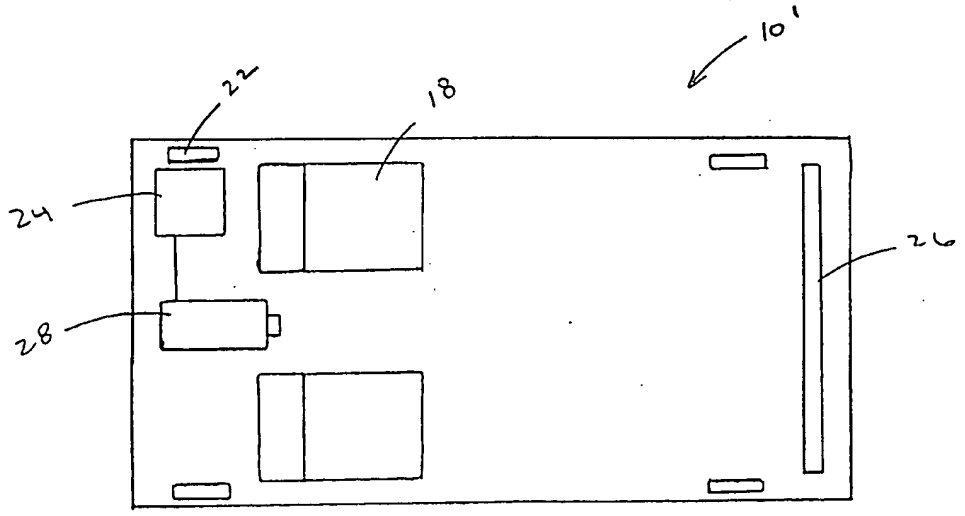

FIG. 4

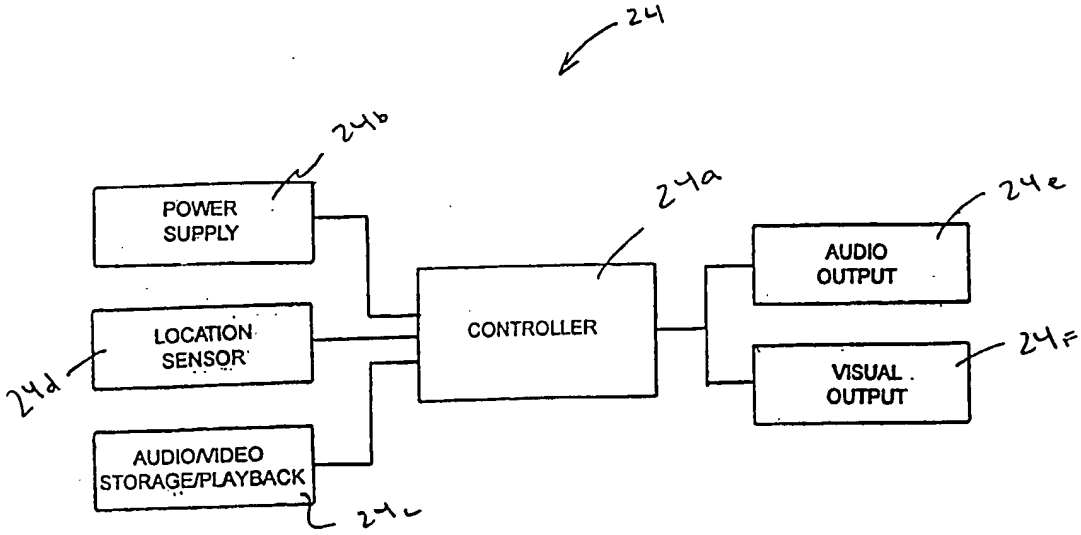
24
24b
POWER SUPPLY
24a
24e
AUDIO OUTPUT
LOCATION SENSOR
24d
CONTROLLER
24f
VISUAL OUTPUT
AUDIO/VIDEO STORAGE/PLAYBACK
24c

FIG. 5

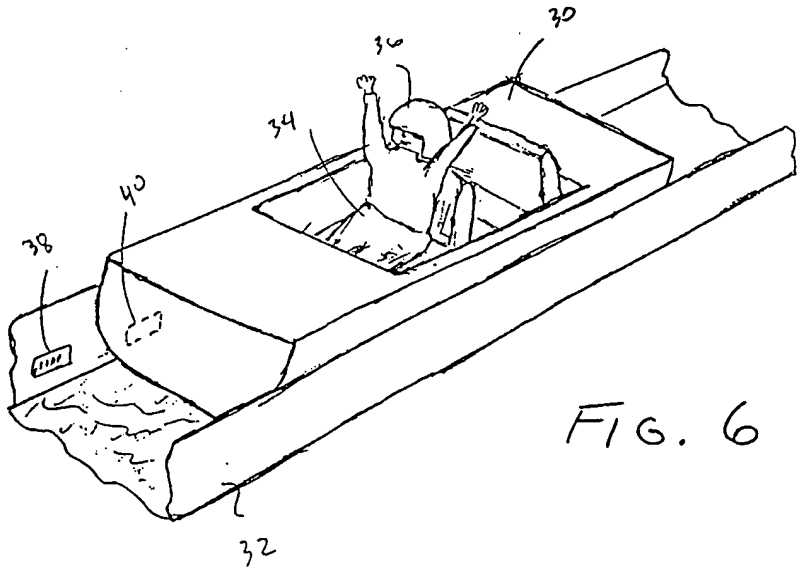
30
36
34
40
38
32

FIG. 6

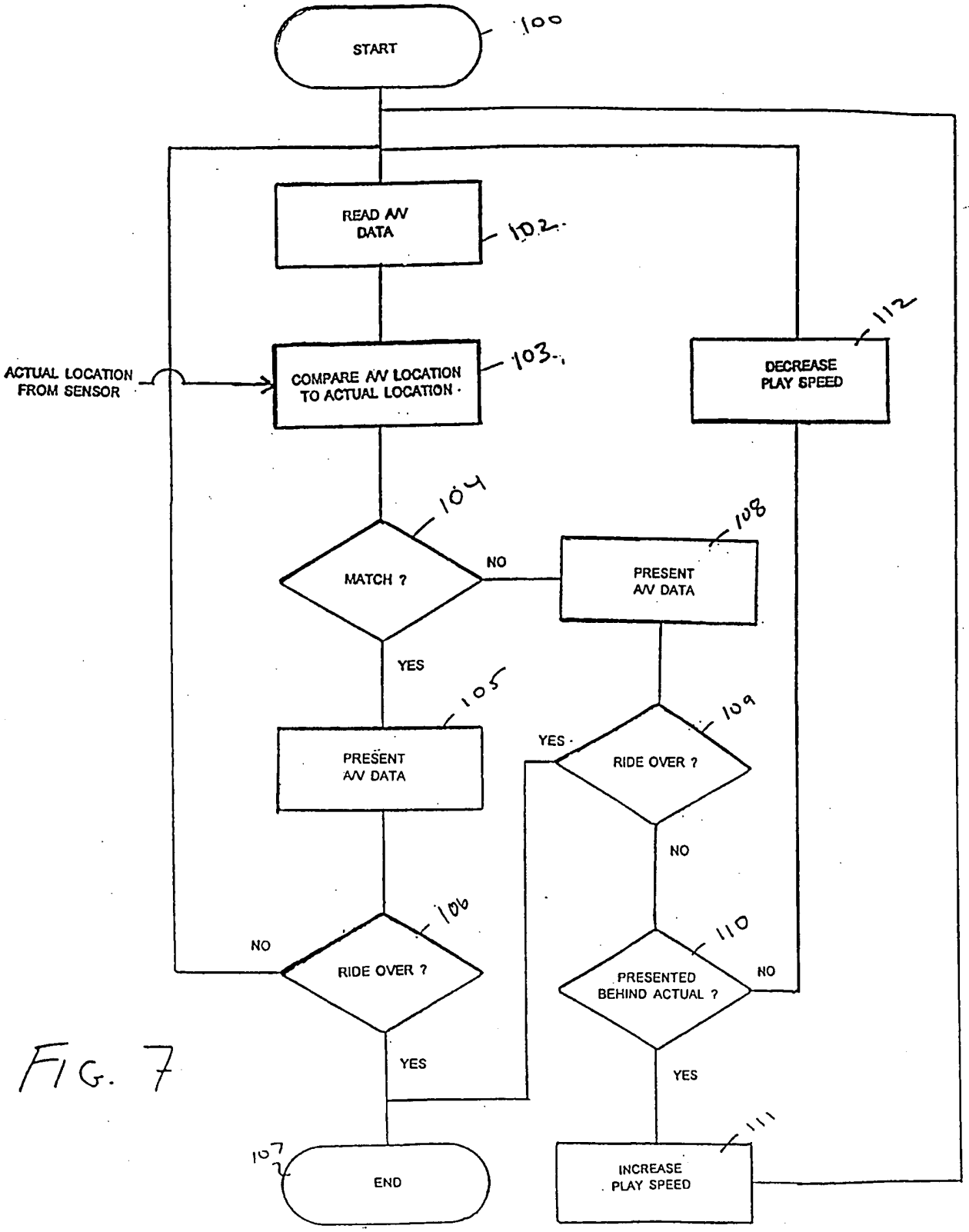
START
100
READ A/V DATA
102
ACTUAL LOCATION FROM SENSOR
COMPARE A/V LOCATION TO ACTUAL LOCATION
103
DECREASE PLAY SPEED
112
104
MATCH ?
NO
108
PRESENT A/V DATA
YES
105
PRESENT A/V DATA
YES
109
RIDE OVER ?
NO
106
NO
RIDE OVER ?
110
PRESENTED BEHIND ACTUAL ?
NO
YES
YES
107
END
111
INCREASE PLAY SPEED

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/00522

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A63G 31/16

US CL :104/53, 63, 73, 84; 472/60, 64

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 104/53, 63, 73, 84; 472/60, 64

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P --- Y	US 5,669,821 A (PRATHER et al) 23 September 1997, whole document.	1-3,5-8,10,13 --- 4,9,11-12,14-28
Y	US 5,336,132 A (MURAKAMI) 09 August 1994, whole document.	4,12,21,27
Y	US 3,889,605 A (BACON) 17 June 1975, col. 2, lines 29-36.	9,14-28
Y	US 5,382,026 A (HARVARD et al) 17 January 1995, whole document.	11,26

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer S. JOSEPH MORANO Telephone No. (703) 308-1113

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